On Procalistes, a Young Cephalopod with Pedunculate Eyes, taken by the "Challenger" Expedition.

By

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Mr. John Murray, the director of the "Challenger" publications has kindly placed in my hands for examination three specimens of a very young Cephalopod—mounted for microscopic study—together with a drawing and notes by the late Dr. R. von Willemoes Suhm relating thereto.

Dr. Suhm's drawing is reproduced in the woodcut, fig. 1. The following note from his journal refers to these specimens:

"16th June, 1874.—Among the surface gatherings there is a transparent and very interesting Pteropod, with large eyes on the tentacles and without any 'ptera' or foot. Having obtained three more or less damaged specimens from which I could not complete its anatomy, I shall have to defer giving a proper account of it. The animal belongs to the Clionidæ, and is probably allied to Pelagia, Quoy and Gaimard."

With Suhm's drawing of the animal are the following notes:

"Clionid Pteropod: June 16th—18th, 1874. In the warm East Australian current coming from the north (surface temperature 18° C.), together with Calcarella on the voyage from Sydney to Wellington, lat. 34° 50′ S., long. 155° 28′ E. In all only three specimens, of which the largest alone showed the eyes well. It measured 13 mm. long; tentacles 6—7 mm. long; eye-peduncles 2 mm. long. Neither of the smaller specimens showed anything new. Tentacles with suckers, of

which one is strongly magnified below (woodcut, fig. 1, B). Mouth with six suckers, two teeth, and radula; the latter, as far as I could make it out without injury to the animal, is drawn below to the right hand side (woodcut, fig. 1, C). The mouth leads into an œsophagus; this into a muscular stomach, in the muscular wall of which is a unicellular gland à la nematode. Sharply defined intestine which I could not follow out to the anus on the process to the right (woodcut, fig. 1, *f*). Ganglion superius sends out the nerves to the eyes; between it and the ganglion inferius are the two otolithic vesicles. On the right side the generative gland is seen with reddish oil specks, and in the corner black pigment; to the left is a cellular body, probably an excretory organ. Subsequently it seemed to me as though there were a calamus in the hindermost portion of the animal; this must, however, have been a mistake. Heart not seen."

It is obvious from the above notes that Suhm had not completed his examination of this interesting organism. The three specimens, of which only two are in such a state as to be useful for examination, have been carefully studied by me, and from these and the information afforded by Suhm, I have constructed a second figure (woodcut, fig. 2), which is placed by the side of Suhm's original drawing. Suhm's drawing being made from fresh specimens affords evidence of various interesting details, and I have thought it right therefore to reproduce it intact. The preserved specimens studied by me are also much older than that drawn by Suhm, which is apparently the one which has completely decomposed. This specimen is half the length of the other two, and whilst it, as shown in Suhm's drawing, possessed suckers both on the long arms and near the mouth, no suckers at all are present in the larger examples. They may possibly have been rubbed off by rough usage of the specimens, but I incline to believe that they are naturally absent in the later stage, though present in the youngest stage as drawn by Suhm. Probably owing to its firm contraction in the living condition, the mantle-flap escaped altogether the observation of Suhm, and this led him to the notion that the animal

before us was a Gymnosomatous Pteropod. That notion was further encouraged by the existence of only two arm-like processes of the forefoot, bearing suckers, these having, as must be at once admitted, a strong resemblance to the sucker-bearing arms of the Gymnosomatous Pteropod, Pneumodermon. When once the mantle-flap and the subpallial chamber are overlooked, it is natural to interpret the conical process marked *f* in figs. 1 and 2 as the anus, and to conclude that the supposed Pteropod has no representative of the mesopodium or "ptera." In reality, however, the little creature is not a Pteropod, but one of the Siphonopoda (the group to which the term Cephalopoda is usually restricted). It is not gymnosomatous, but as shown in fig. 2, it has the usual mantle-flap and subpallial chamber characteristic of the cuttle-fishes. The supposed anal cone (figs. 1 and 2, *f*) is in reality the funnel or siphon, and the true anus is placed within the subpallial chamber near the spiral mass of pigment noted by Suhm (figs. 1 and 2, *g*).

The rolling up of the two lateral growths of the mesopodium to form a funnel or siphon is the absolute and distinctive race-mark of the Siphonopoda or Cephalopoda sensu restricto. There can therefore be no further doubt about the affinities of Suhm's organism. At the same time I may point out a few additional characteristics which it presents, and are only to be found among the cuttle-fishes.

(1) Near the anus (*g*) is a spiral mass of black pigment. This is the secretion of the ink-sac seen through the walls of that sac. The spiral form of its lumen is characteristic. The ink-sac is distinctively characteristic of the Dibranchiata.

(2) A number of chromatophor-cells, exactly resembling those of young Loligo, are scattered over the surface of the body in the integument (fig. 2, *h*). Only Dibranchiata are known to have chromatophors of this particular form and appearance.

(3) There is (as Suhm observed, but could not persuade himself to believe) a very delicate (probably horny) "pen" sunk beneath the integument of the antero-dorsal surface (see woodcut, fig. 2, *i*). Such a pen exists only in the Dibranchiate Siphonopoda.

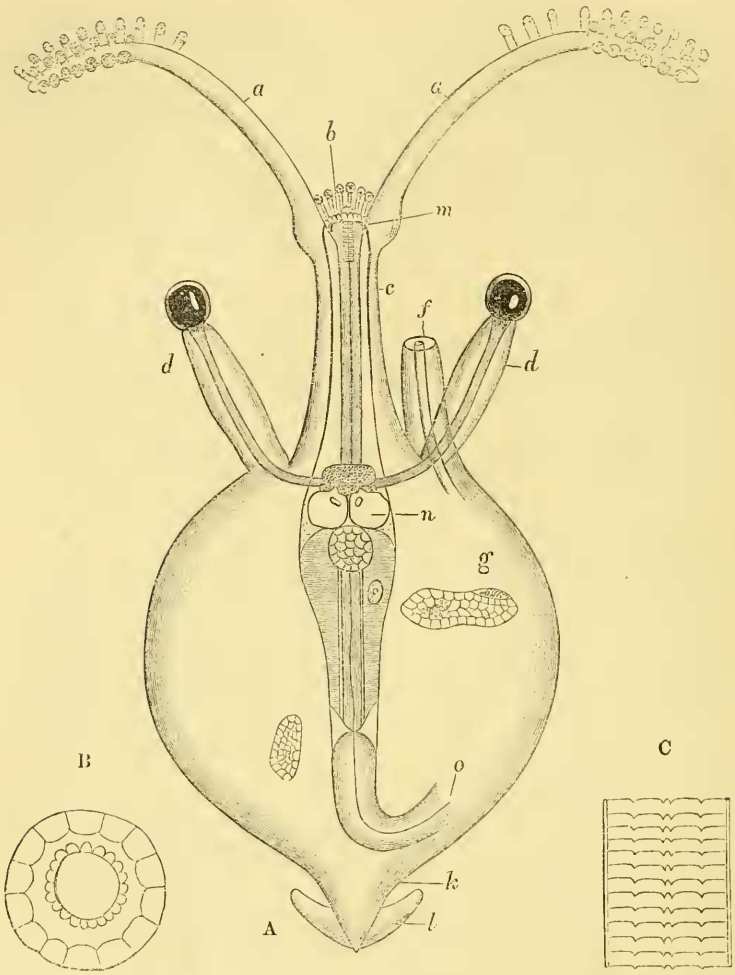

FIG. 1.—A. Youngest specimen of Procalistes Suhmii, gen. et sp. nov. Drawn by R. von Willemoes-Suhm from a living specimen. Magnified 25 diameters. *a*. The long "arms" or processes of the fore-foot. *b*. The six small suckers, representing the eight short processes of the fore-foot of a typical Decapod. *c*. The elongated neck. *d*. The pedunculated eyes. *f*. The funnel or siphon. *g*. The anal process seen through the transparent mantle. *k*. The median posterior process of the body. *l*. The lateral fins attached to the same. *m*. The buccal apparatus. *n*. The oto-cysts. *o*. The intestine.

B. One of the suckers of the long arms, more highly magnified. C. A portion of the lingual ribbon, more highly magnified.

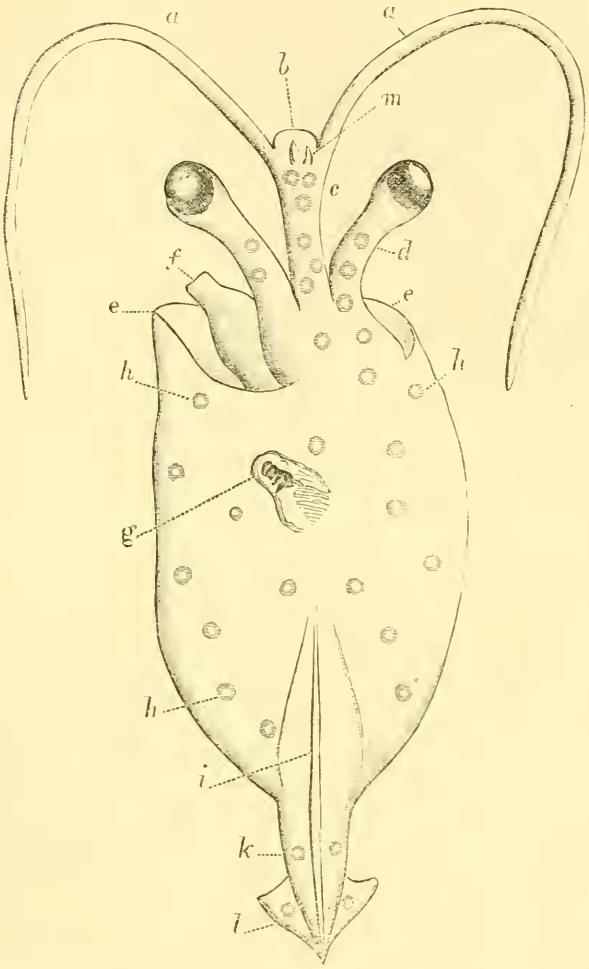

FIG. 2.—A somewhat older specimen of Procalistes Suhmii. Drawn b E. Ray Lankester from a specimen mounted on a glass slide in balsam by R. von Suhm. Magnified 20 diameters. *a*. The long "arms" or processes of the fore-foot. *b*. The smooth buccal margin devoid of processes. *c*. Th elongated neck. *d*. The pedunculated eyes. *e*. The edge of the mantle flap, separated from its attachment to the head and funnel by pressure. *f*. The funnel or siphon. *g*. The anal process seen through the transparent mantle, and showing a spiral band of black pigment lying in the ink-bag. *h*. Chromatophores. *i*. The pen. *k*. The median posterior process of the body. *l*. The lateral fins attached to the same. *m*. The two horny beaks of the buccal apparatus.

(4) The sharp horny beaks placed at the entrance to the mouth (fig. 2, *m*) are unlike the buccal armature of any mollusc excepting the true cuttle-fishes.

This Clionid-like form is then without doubt a very young condition of a Dibranchiate Siphonopod. In some details it presents important resemblance to the genus Cranchia.

The genus Cranchia was founded by Leach in 1817; three species are described from the Atlantic Ocean. I take the following characters from 'Bronn's Thierreich.' The body is globular, with terminal paired fins carried on a special prolongation of the body. The mantle is attached to the head by a nuchal band, and is fused on each side to the base of the funnel. (A similar disposition in his young Cephalopod accounts for Suhm's not having detected the free edge of the mantle-flap in the fresh specimens observed by him. Under pressure, when mounted with a cover-glass for the microscope, the mantle has become detached from the base of the funnel, as represented in my drawing, fig. 2, which must therefore be regarded as representing the animal in an artificial condition.) The head is small, with large eyes; the cornea presents only a small slit. The two prehensile arms are long; the smaller arms, eight in number, very short. There are two rows of suckers to the arms. The funnel is long; it is devoid of attachment to the head, and without internal valve. The pen extends along the whole length of the back (antero-dorsal surface), and is thin, soft, small, and pointed at each end.

This description applies in most respects to the young Cephalopod now in question. The differences and peculiarities presented by the "Challenger" specimens are, on the one hand, such as might possibly occur in the young form as compared with the adult; on the other hand they are more probably due to the fact that we have before us a new genus allied to Cranchia.

The important peculiarities presented by Suhm's young Cephalopod are:

(1) The pedunculation of the eyes.

(2) The exceedingly rudimentary character of the shorter arms or perioral processes of the forefoot in the youngest stage observed (fig. 1, *b*), and their total absence as well as the disappearance of the suckers of the long arms in the older specimens.

The elevation of the eyes on stalks relatively so long and so well-marked as in the present instance, is not, I believe, known in any other Siphonopod. Possibly it is only a transient arrangement — disappearing as growth proceeds; but such an elevation of the eyes is not presented by the young of Sepia, Loligo, Octopus, or Argonauta, which are the only members of the group whose young forms are certainly known.

The rudimentary character of the perioral arms is very remarkable. Suhm describes them simply as "six suckers." In the preserved specimens (which it is necessary to point out are in a very poor condition) there is no trace of any perioral suckers or processes. It is important to notice that in Owen's figure of Cranchia scabra (reproduced in Bronn) eight small perioral lobes or arms bearing suckers are figured, of which six are much larger than the other two. It might be possible to regard Suhm's drawing as indicating a young condition of these six perioral lobes, but the fact that they disappear instead of growing bigger in the older specimens, necessitates a different conclusion. Suhm's Cephalopod must be placed in a new genus which stands alone in the fact that its suckers and also its perioral foot-lobes, excepting the long pair, are aborted.

For this genus I propose the name Procalistes (in allusion to H.M.S. "Challenger"), whilst the species can best be named after its discoverer, P. Suhmii.

The genus may be defined thus:

——. Similar to Cranchia, excepting that the eyes are pedunculate, that the shorter perioral arms are aborted, and that the longer (so-called prehensile) arms are devoid of suckers. In the youngest stage observed there are two rows of suckers on the long arms, and six isolated and pedunculated suckers sur-

rounding the mouth, which appear to represent the shorter arms of other Cephalopods.——

I cannot conclude this notice without drawing attention to the correctness of Suhm's recognition of a general resemblance between his young Procalistes and such a Pteropod as Pneumodermon. The reduction of the forefoot in the former to the condition of two long sucker-bearing arms and a minute set of perioral sucker-bearing processes, finds its parallel—its "homoplast," if I may use a term introduced by me some years ago—in the condition of the same parts in Clione and Pneumodermon.

Lastly, is there not some resemblance to the condition of the Belemnitidæ in the marked projection of the terminal region of the body to which the lateral fins are attached, and in which the pen (in these young specimens at any rate) is most strongly developed, as also occurs in the living genus Ancistrocheirus?